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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/658,039	09/09/2003	Patrick M. Martin	67493/63	2002
1912	7590	08/02/2005	EXAMINER	
AMSTER, ROTHSTEIN & EBENSTEIN LLP 90 PARK AVENUE NEW YORK, NY 10016			ROSASCO, STEPHEN D	
			ART UNIT	PAPER NUMBER

1756

DATE MAILED: 08/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/658,039

Applicant(s)

MARTIN ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2/18/05.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

Detailed Action

Claims 1-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The subscripts in the formulas for the etch stop layer are not defined in the claims.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Hanyu et al. (5,876,877).

Hanyu et al. teach an optical exposure mask for patterning an optical beam, comprising: an etching stop layer of a material containing MgO or a compound formed from MgO and Al.sub.2 O.sub.3, said etching stop layer having upper and lower major surfaces and said material being substantially transparent to the optical beam used for the exposure;

a transparent pattern of a material provided on one of said upper and lower major surfaces of said etching stop layer, said transparent pattern passing the optical beam freely; and

an opaque pattern provided on one of said upper and lower major surfaces of said etching stop layer for patterning the optical beam, said opaque pattern being defined by an edge, said etching stop layer having an etching rate substantially smaller than an etching

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rate of the material that forms the transparent pattern for any of dry and wet etching processes, and said transparent pattern being provided along said edge of said opaque pattern and having a thickness set to cancel a diffraction of the optical beam at said edge of said opaque pattern.

And in which said material forming the transparent pattern comprises silicon oxide and the material forming the etching stop layer has an etching rate that is substantially smaller than the etching rate of silicon oxide.

And wherein said material forming said etch stop layer is selected from a group consisting of MgO and a mixture of MgO and Al₂O₃.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quek et al. (6,582,856) in view of Hanyu et al. (5,876,877).

The claimed invention is directed to a photomask blank, the mask made from the blank and the method of making an alternating aperture phase shift photomask comprising: (a) a photosensitive resist material layer; (b) an opaque layer underlying said photosensitive resist material layer; (c) a deposited substantially transparent layer underlying the opaque layer; (d) a substantially transparent etch stop layer underlying the deposited substantially transparent layer; and (e) a substantially transparent substrate underlying the substantially transparent etch stop layer, wherein said deposited

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substantially transparent layer is of a thickness equal to $\lambda/2(n-1)$, where λ is a wavelength of an exposure tool intended to be used with said photomask after processing.

And wherein said substantially transparent etch stop layer is comprised of MgF₂.

And wherein said substantially transparent etch stop layer is comprised of Al₂O₃.

The applicant discusses the limitations of the prior art in that in the aaPSM substantially transparent regions (which are un-etched) alternate with etched recesses 14 between each opaque region 15, as shown in FIGS. 2a-b. The effect of this structure when placed in a Stepper is to create light intensity of alternating polarity and 180 degree out of phase, as shown in FIG. 2c. This alternating polarity forces energy transmitted from the Stepper to go to zero, in theory, at opaque regions 15 while maintaining the same transmission of light at the alternating transparent regions 13 and recesses 14. As a result, refraction is reduced through this region.

The claimed invention is directed to providing an improved aaPSM that allows for end point detection using an OES technique, and allows for additional overetch time to adjust for any non-uniformities associated with plasma loading effects due to pattern density on the photomask.

Quek et al. teach a method of fabricating a phase shifting mask for use in the manufacture of an integrated circuit device comprising: providing a transparent substrate comprising quartz; depositing a transparent etch stop layer overlying said transparent substrate; depositing a phase shifting layer overlying said transparent etch stop layer; depositing an opaque layer overlying said phase shifting layer; depositing a resist layer overlying said opaque layer; patterning said resist layer; etching said opaque layer and said phase shifting layer wherein said resist layer masks said etching, wherein said opaque

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layer is etched through, wherein said transparent etch stop layer prevents etching into said transparent substrate, wherein notches are etched into said phase shifting layer at the edges of said opaque layer, wherein said notches cause a phase shift in incident light relative to incident light passing through regions in said phase shifting layer adjacent to said notches, and wherein an overetch is performed during said etching to remove any mask defects in said phase shifting layer; and removing said resist layer to complete said phase shifting mask in the manufacture of said integrated circuit device.

And wherein said transparent etch stop layer comprises one of the group of: silicon nitride and silicon oxynitride.

The teachings of Quek et al. differ from those of the applicant in that the applicant teaches different materials for the transparent etch stop layer.

Hanyu et al. teach an optical exposure mask for patterning an optical beam, comprising: an etching stop layer of a material containing MgO or a compound formed from MgO and $\text{Al}_{0.2}\text{O}_{0.3}$, said etching stop layer having upper and lower major surfaces and said material being substantially transparent to the optical beam used for the exposure;

a transparent pattern of a material provided on one of said upper and lower major surfaces of said etching stop layer, said transparent pattern passing the optical beam freely; and

an opaque pattern provided on one of said upper and lower major surfaces of said etching stop layer for patterning the optical beam, said opaque pattern being defined by an edge, said etching stop layer having an etching rate substantially smaller than an etching rate of the material that forms the transparent pattern for any of dry and wet etching

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processes, and said transparent pattern being provided along said edge of said opaque pattern and having a thickness set to cancel a diffraction of the optical beam at said edge of said opaque pattern.

And in which said material forming the transparent pattern comprises silicon oxide and the material forming the etching stop layer has an etching rate that is substantially smaller than the etching rate of silicon oxide.


And wherein said material forming said etch stop layer is selected from a group consisting of MgO and a mixture of MgO and Al₂O₃.

Therefore, it would have been obvious to one having ordinary skill in the art to take the teachings of Quek et al. and combine them with the teachings of Hanyu et al. in order to make the claimed invention because Hanyu et al. teach the benefits for using these materials in the specific application for a transparent etch stop layer.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
07/28/05